



LEGACY INFRASTRUCTURE TO ENTERPRISE CLOUD USING CO-EXISTENCE FRAMEWORK

A CASE STUDY ON COEXISTENCE
AND DIGITAL TRANSFORMATION

ABOUT THE CLIENT

The **Reserve Bank of India (RBI)** as a **Central Bank** manages the financial fabric & monetary policies for one of the largest G20 countries, India and is one of the most complex central banks in the world. with a **balance sheet size of USD 0.92 Trillion**. RBI has been transformed from 4 large mainframe systems running multiple applications into Intellect Quantum (eKuber 1.0) deployed in HP Superdome in 2011. Further, this has been **upgraded into modern eMACH.ai Quantum (eKuber 2.0) in 2023 with 7 MVPs released into production over 21 months** using a co-existence model.

In addition to executing monetary policy, the RBI is a key player in the financial services ecosystem, wherein it maintains foreign exchange reserves, facilitates public debt (Bonds/Bills) floatation/servicing and provides a wide range of services including payments/receipts for 51 govt. entities, manages the currency life-cycle and regulates the Indian banking industry to ensure financial stability.

RBI was among the first central banks to adopt the digital transformation journey to build a robust banking system. With the increased macroeconomic volatility, central banks like RBI have an acute need for real-time visibility of the financial system's health with better controls. They need to **future-proof the central banking infrastructure to deal with the evolving complexities and increasing volume of transactions** within the nation's financial system. RBI further strengthened the nation's financial system backbone by implementing the upgraded version of the Intellect Quantum to cater to the evolving requirements.

450+ Member Banks	69,000 Users
51 Government Entities	3,200 Currency Chests
USD 588+ Billion Payments Per Year	USD 666+ Billion Receipts Per Year

Faster policy implementation

Unmatched flexibility, agility, resiliency and scale

Risk-free Migration

No disruption to 24x7x365 operation.

Enhanced operational efficiency. 85% of transactions are managed using STP

Real-time time operations & monitoring

Reduced Total Cost of Ownership

BUSINESS OUTCOMES DELIVERED

Scale, Performance and Cost Efficiency at Global Benchmark Levels

Intellect Quantum (eKuber 2.0) today operates at a scale and efficiency that places the RBI among a select group of technologically advanced central banks globally. The platform processes approximately **1.2 billion transactions annually including ~997 million payments/receipts for 51+ government entities, at an average cost per transaction of ~INR 0.39 (~USD 0.0043)**, running on a highly optimized infrastructure footprint of just **72 Core Dell x86-64 based Tanzu enterprise cloud for application and 39 IFLs on IBM Z16 for database**. This level of throughput and unit-cost efficiency compares favorably with global peers, where large central banks typically incur materially higher per-transaction costs due to legacy monolithic systems, fragmented platforms, or heavier infrastructure overheads.

The nextgen **Intellect Quantum solution is cloud-agnostic, with enriched UI/UX, and built on eMACH.ai (Events driven, Microservices based, API First, Cloud Native, Headless architecture with embedded business impact AI framework) architecture** future-proofed for the next decade or more.



What is particularly noteworthy is that this transformation was achieved through a **21-month upgrade journey from eKuber 1.0 to eKuber 2.0**, using a carefully architected co-existence model, ensuring **zero disruption** to mission-critical national financial operations **24x5x365 with continuous policy implementations through the transition ensuring 100% uptime**. With the successful transition to a **cloud-native, microservices-based architecture deployed on RBI's multi-zone enterprise cloud**, the RBI is now among the first central banks globally to operate entire central banking functions on an enterprise cloud, delivering superior scalability, resilience, security, and cost efficiency. This positions RBI not only as one of the world's largest central banks by volume, but also as one of the most technologically progressive and operationally efficient.

The Tanzu enterprise cloud platform was architected for **high availability and resilience**, deployed across multiple availability zones with support for **multi-cluster and multi-site operations**. Built-in capabilities such as self-healing, rolling upgrades, and automated workload failover ensure uninterrupted service for mission-critical central banking operations with fully automated **DevSecOps pipeline, significantly improving application deployment speed, scalability, and operational agility**. Beyond implementation, Intellect provides **24x7x365 operational support**, ensuring continuous availability, performance, and compliance of the enterprise cloud infrastructure supporting RBI's central banking ecosystem.



BACKGROUND

In 2011, the RBI implemented Intellect Quantum, a purpose-built central banking technology solution, to progressively modernize their financial operations from 4 large mainframe systems running multiple applications into the modern HP Superdome infrastructure. The RBI moved away from a system hampered by decades of custom development and huge manual operations adopting a completely real-time, highly automated, and extremely flexible platform, consolidating all the applications into one integrated solution. The RBI's entire central banking operations are supported by Intellect Quantum solution, popularly known as e-Kuber in the RBI, the Government of India, and within the Indian financial ecosystem. With Intellect Quantum, the RBI integrated three distinct stakeholders: The government (Central and State), 450+ financial institutions and public for various benefit distribution, leveraging architecture designed for speed and streamlined workflows.

Fast forward, the volume of transactions, particularly for government payments and receipts tremendously increased to over nearly a billion in volume. In order to keep pace with this evolving high demand and digital infrastructure in India, RBI decided to transform the monolithic architecture into a modern enterprise cloud based microservices architecture in 2022 and have chosen to deploy the latest version of the Intellect Quantum (eKuber 2.0) designed using eMACH.ai (event driven microservices based, API first, cloud-agnostics, headless architecture with embedded business impact AI) in a high performance enterprise cloud.

INTELLECT QUANTUM

Intellect Quantum is the world's first and **only digital banking technology solution** that is purpose built for central banks to efficiently manage every aspect of their financial market operations. Intellect Quantum caters to key central banking functions involving monetary policy implementation, financial stability, currency management, public debt (bonds/bills) floatation and management, wide range of government payments/receipts, risk management and reserves management.

POWERING RBI'S FINANCIAL OPERATIONS



BANKING SERVICES

- Online portal with 300+ services for the 450+ FIs to self-manage large part of operations with RBI.
- Vault/Teller Management.
- Continuous clearing and remittances.
- Agency banking support for Govt. transactions.
- Comprehensive fees & charges management



CREDIT/MARKET OPERATIONS

- Support for a wide range of monetary policy tools and market operations.
- Fully automated intraday liquidity to RTGS and various settlements.
- Advanced collateral management.



GOVERNMENT SERVICES

- Treasury Single Account (TSA) at the national level.
- Support for a wide range of govt. account types including budget linked accounts
- Automated surplus & deficit management.
- Advanced sweeping & pooling for efficiency fund administration involving thousands of govt. accounts.
- Support for foreign borrowing, sovereign gold bonds.



ENTERPRISE GENERAL LEDGER

- Real-time financial statements/ balance sheet and integrated budget/FA



CURRENCY AND VAULT MANAGEMENT

- Online portal for entire currency life cycle management with real-time operation & monitoring.
- Comprehensive management of the currency lifecycle from planning to the destruction.



DEPOSITORY & PUBLIC DEBT MANAGEMENT

- Integrated public debt (Bond/Bills) management including underwriting for Central, State and Municipal Govt. Bonds.
- Depository with complete lifecycle support for securities up to redemption



RESERVE PORTFOLIO MANAGEMENT

- Advanced reserve portfolio management
- Support for FX, FI, MM, Derivatives, Limits, IMF SDR management, ACU with advanced deal simulation.
- Fully automated deal life-cycle management
- Multidimensional risk analytics



TRADE FINANCE

- Comprehensive life-cycle management of import/export LCs and export credit refinance.



NATIONAL PAYMENT & SETTLEMENT

- Wide range of payment & receipt services for 51+ govt. entities including fully-automated GST (Tax) life-cycle & dispute management.
- Support for a wide range of payment & security infrastructure settlements including CBDC

FUTURE-PROOF SOLUTION FOR 2023 AND BEYOND

With the increasing complexity within the financial ecosystem, the RBI required this integrated digital technology solution to be more flexible and future-ready for the next decade with cutting edge cloud-native technology stack. They wanted the system to be highly composable without the need for any redeployment of solution as the capabilities get enhanced over time. They wanted easy addition and configuration of new modules per the latest requirements with minimum or no impact on operations. They needed provisions to accommodate multiple government accounts under each entity.

Intellect Design Arena, with a vision to deliver the best-in-class, real-time, API-based, on-demand solution with the latest and proven technologies, unbeatable functionality, and a rich user experience, developed the next-gen Intellect Quantum 23 (eKuber 2.0) for the RBI.

This upgraded solution is built on the revolutionary **eMACH.ai (Events driven, Microservices-based, API-enabled, Cloud Native, Headless with underlying AI models)** architecture, is deployed on the RBI's private cloud and is equipped with:



Microservices based container deployment for improved efficiency, flexibility, scalability and future proofing

60+

key business components

22

advanced frameworks

750+

user journeys

450+

interface touchpoints

70+

microservices

350+

services in online portal

30M+

benchmarked to support 30M+ ISO20022 messages per day

113M+

benchmarked to support 113M+ transactions per day (14 hours)



Advanced integration framework (iTurmeric)



API first, Cloud Native and Cloud Neutral Architecture



Open APIs for ease of RBI ecosystem integration, including governments, member banks, partners, vendors, and system integrators



Equipped to handle projected scale of RBI operations for the next decade



Seamless transition from eKuber 1.0 to the nextgen eKuber 2.0

ENHANCED FUNCTIONALITIES

- Enhanced features to address emerging requirements, like government operations support, collateral management, reconciliation, advanced business rule driven sweeping and reverse sweeping, and many more.
- Government Portal - Enhanced dashboard with real time loan positions, payments & receipts analytics and on-the-fly reports
- Commercial Banking Portal-simplified user journeys and prioritized processing of critical services
- Currency Management Portal with refreshed user interface and critical function enhancements
- DevSecOps - **Advanced security framework certified by industry leading security organizations**, to protect from all cyber threats
- Continuous Delivery of services with K8s based operations with Blue/Green Hot Deployments
- Multi-layered Security at data, transport, storage, in-flight, access, integration, centralized and modules.
- Enhanced STP across functions
- Reduced inter-module level dependencies
- User-friendly parameter configuration Provision to accommodate 1K+ government accounts under each entity
- Support for wider government entities, including district, taluk, and village offices
- ePayments and eReceipts transactions volume per year is ~997 Million and value of these transactions are ~113Trillion(\$1.35 trillion USD)**

BEST-IN-CLASS USER EXPERIENCE



User-centric, multilingual and intuitive interface/experience



Improved & flexible report generation tool for adhoc reporting



Real-time dashboards with integrated view of operations, finance and transactions cutting across all the RBI departments, Commercial Banks and Government entities



70+ contextual dashboards for business users and top management teams



In-built chatbot for real-time support



Simplified screens with redefined contextual fields based on the user journey best practices from central banks across the globe.



Maximum 3-clicks to any data



Fully managed cloud infrastructure by Intellect and partners



Simplified screens with redefined contextual fields based on the user journey best practices from central banks across the globe